



(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:  
**24.10.2012 Bulletin 2012/43**

(51) Int Cl.:  
**H01L 31/18** <sup>(2006.01)</sup> **H01L 31/052** <sup>(2006.01)</sup>  
**H01L 31/075** <sup>(2012.01)</sup> **H01L 27/142** <sup>(2006.01)</sup>

(43) Date of publication A2:  
**16.03.2011 Bulletin 2011/11**

(21) Application number: **10176185.6**

(22) Date of filing: **10.09.2010**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR**  
Designated Extension States:  
**BA ME RS**

(71) Applicant: **KISCO**  
**Gyeongsangnam-do 641-370 (KR)**

(72) Inventor: **Myong, Seung-Yeop**  
**156-831, Seoul (KR)**

(74) Representative: **Ferreccio, Rinaldo**  
**Botti & Ferrari S.r.l.**  
**Via Cappellini, 11**  
**20124 Milano (IT)**

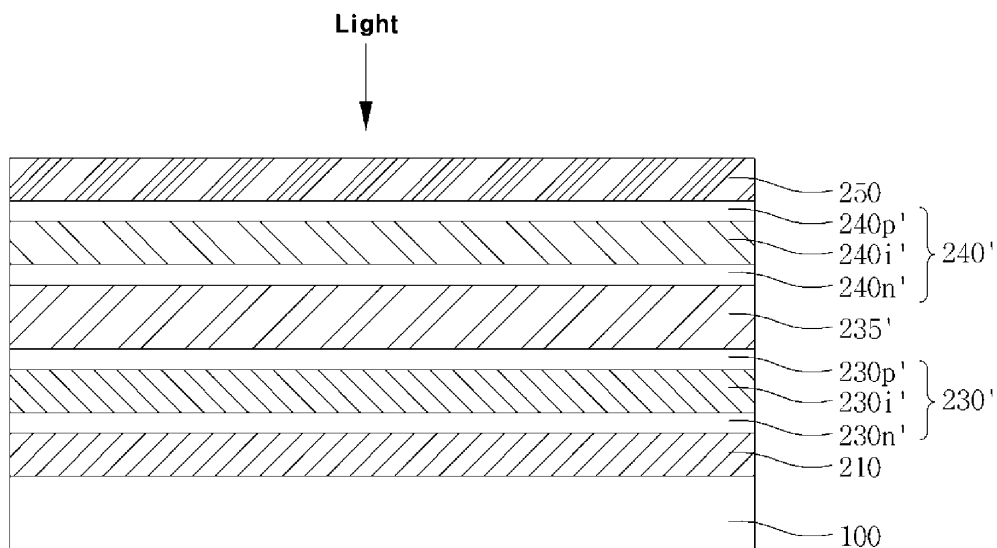
(30) Priority: **11.09.2009 KR 20090085718**

(54) **Photovoltaic device and method for manufacturing the same**

(57) Disclosed is a method for manufacturing a photovoltaic device. The method includes: forming a first electrode on a substrate; forming a first unit cell on the first electrode, the first unit cell comprising an intrinsic semiconductor layer; forming an intermediate reflector on the first unit cell, the intermediate reflector comprises

a plurality of sub-layers stacked alternately by modulating the applied voltages in accordance with time, the applied voltages exciting plasma and having mutually different frequencies; forming a second unit cell on the intermediate reflector, the second unit cell comprising an intrinsic semiconductor layer; and forming a second electrode on the second unit cell.

**【 Fig.6】**





## EUROPEAN SEARCH REPORT

Application Number  
EP 10 17 6185

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2006 319068 A (KANEKA CORP) 24 November 2006 (2006-11-24)	15-27	INV. H01L31/18 H01L31/052 H01L31/075 H01L27/142
A	* paragraphs [0010], [0012] - [0014], [0024] - [0029], [0030] - [0034]; figure 1 *	1-14	
A	----- BUEHLMANN P ET AL: "In situ silicon oxide based intermediate reflector for thin-film silicon micromorph solar cells", APPLIED PHYSICS LETTERS, AIP, AMERICAN INSTITUTE OF PHYSICS, MELVILLE, NY, US, vol. 91, no. 14, 2 October 2007 (2007-10-02), pages 143505-1-143505-3, XP012099595, ISSN: 0003-6951, DOI: 10.1063/1.2794423 * pages 143505-1; figures 1,2 *	1,15	
A	----- DAS CHANDAN ET AL: "A constructive combination of antireflection and intermediate-reflector layers for a-Si <sub>1-x</sub> Ge <sub>x</sub> 1/4 c-Si thin film solar cells", APPLIED PHYSICS LETTERS, AIP, AMERICAN INSTITUTE OF PHYSICS, MELVILLE, NY, US, vol. 92, no. 5, 8 February 2008 (2008-02-08), pages 53509-1-53509-3, XP012108130, ISSN: 0003-6951, DOI: 10.1063/1.2841824 * the whole document *	1,15	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01L
The present search report has been drawn up for all claims			
Place of search Berlin		Date of completion of the search 14 September 2012	Examiner Pantelidis, D
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... &amp; : member of the same patent family, corresponding document</p>			

1  
EPO FORM 1503 03.02 (P04C01)



## EUROPEAN SEARCH REPORT

Application Number  
EP 10 17 6185

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	LAMBERTZ A ET AL: "Thin Film Silicon Solar Cells On Transparent And Flexible Plastic Films", 21ST EUROPEAN PHOTOVOLTAIC SOLAR ENERGY CONFERENCE PROCEEDINGS, DRESDEN, GERMANY, 4 - 8 SEPTEMBER 2006, WIP RENEWABLE ENERGIES, MÜNCHEN, 4 September 2006 (2006-09-04), pages 1771-1774, XP040512552, ISBN: 978-3-936338-20-1 * the whole document *	1,15	
A	FINGER F ET AL: "Structural investigation and growth of <n>-type microcrystalline silicon prepared at different plasma excitation frequencies", JOURNAL OF NON-CRYSTALLINE SOLIDS, NORTH-HOLLAND PHYSICS PUBLISHING. AMSTERDAM, NL, vol. 198-200, 1 May 1996 (1996-05-01), pages 927-930, XP004243161, ISSN: 0022-3093, DOI: 10.1016/0022-3093(96)00088-9 * the whole document *	1,15	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
Place of search Berlin		Date of completion of the search 14 September 2012	Examiner Pantelidis, D
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... &amp; : member of the same patent family, corresponding document</p>			

1  
EPO FORM 1503 03.82 (P04C01)

